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Comparisons and Limitations of Gradient Augmented Level Set and Algebraic Volume of Fluid Methods LAKSHMAN ANUMOLU, DOUGLAS RYDDNER, MARIO TRUJILLO, University of Wisconsin Madison — Recent numerical methods for implicit interface transport are generally presented as enjoying higher order of spatial-temporal convergence when compared to classical methods or less sophisticated approaches. However, when applied to test cases, which are designed to simulate practical industrial conditions, significant reduction in convergence is observed in higher-order methods, whereas for the less sophisticated approaches same convergence is achieved but a growth in the error norms occurs. This provides an opportunity to understand the underlying issues which causes this decrease in accuracy in both types of methods. As an example we consider the Gradient Augmented Level Set method (GALS) and a variant of the Volume of Fluid (VoF) method in our study. Results show that while both methods do suffer from a loss of accuracy, it is the higher order method that suffers more. The implication is a significant reduction in the performance advantage of the GALS method over the VoF scheme. Reasons for this lie in the behavior of the higher order derivatives, particular in situations where the level set field is highly distorted. For the VoF approach, serious spurious deformations of the interface are observed, albeit with a deceptive zero loss of mass.

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